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9 Wesley's Engagement with the Natural Sciences

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Among the many topics that could be included in a *Companion* to John Wesley, readers might be surprised to find a chapter devoted to Wesley's engagement with the natural sciences.¹ Or, based on some influential precedents, they may anticipate an exposé of Wesley's opposition to scientific theories and reasoning. Over a century ago, in his *History of English Thought in the Eighteenth Century* (1876), Sir Leslie Stephen contended that “we already find in Wesley the aversion to scientific reasoning which has become characteristic of orthodox theologians” (2:412). Andrew Dickson White echoed this evaluation twenty years later in his (in)famous *History of the Warfare of Science with Theology in Christendom* (1896).

One shortcoming of these critiques of Wesley is that they relied mainly on secondary sources and passing comments in his *Sermons* and *Journal*. As a result, they provide little sense of the scope of Wesley's interest in and publications about the natural world. In 1763 Wesley issued for the benefit of his Methodist people *A Survey of the Wisdom of God in Creation; or, A Compendium of Natural Philosophy*, a two-volume work distilling his reading of several book-length works as well as extracts from the *Philosophical Transactions* of the Royal Society for the Improvement of Natural Knowledge and other journals. By its third edition in 1777 this *Survey* had grown into a five-volume collection. To increase its availability to his followers, Wesley serialized excerpts from the *Survey* in his monthly *Arminian Magazine* beginning in 1781. In addition to this broad ranging work, he also published *The Desideratum; or, Electricity Made Plain and Useful* (1760) and included a number of short pieces about unusual natural phenomena in the *Arminian Magazine*.

¹For more discussion and documentation of points in this chapter, see Randy L. Maddox, “John Wesley's Precedent for Theological Engagement with the Natural Sciences,” *Wesleyan Theological Journal* 44.1 (Spring 2009).

These broader works have been central to a lesser-known series of *positive* appeals to Wesley's precedent for theological engagement with the natural sciences, which paralleled the negative evaluations. For example, in 1893 William Mills gave a lecture on "John Wesley an Evolutionist" at the Chit-Chat Club in San Francisco. The lecture was circulated as a booklet and a summary was published in *Popular Science Monthly* the following year.² Sparked by Mills, James Lee enlightened readers of the *Southern Magazine* the same year that "the founder of Methodism wrote out the whole theory of evolution and the origin of species ... eighty-four years before Mr. Darwin published his celebrated work upon the same subject."³ This astonishing claim was echoed by several voices in the 1920s, championing Wesley as a forerunner for accepting evolution in the midst of the controversy that peaked in the Scopes trial. Some of these advocates broadened the argument, presenting Wesley as a pioneer of scientific empiricism in general (in the mode of Francis Bacon and John Locke) and of empirical theology in particular.⁴

The suggestion that Wesley advocated the evolution of species was based on a misreading of his affirmation of the biological model of the "chain of being" (see below).⁵ This was just one of many examples where *both* the sneering dismissal and the sweeping praise of Wesley's engagement with the natural sciences betray their anachronistic nature—casting Wesley within the scientific models and debates of their time, instead of evaluating his publications on science topics within their original context.

Placing Wesley's Engagement in Historical Context

The goal of this essay is to help readers avoid such anachronism, by providing sufficient background to understand and appreciate Wesley's interactions with study of the natural world within their socio-historical

²William Harrison Mills, *John Wesley an Evolutionist* (1893); summarized in *Popular Science Monthly* 46 (1894–95): 284–85.

³James W. Lee, "A Methodist Evolutionist," *Southern Magazine* (Louisville) 4 (1894): 348.

⁴See in particular Frank Wilbur Collier, *John Wesley Among the Scientists* (1928).

⁵They typically quote a passage about nature "raising herself to man" from the ape in Wesley, *Survey of the Wisdom of God in the Creation* (4th edn., 1784), 4:102. But they fail to appreciate that this is a climb in quality of "being," not in time; as one emphasis of the "chain of being" model was that there is neither new creation nor extinction of species.

context. It builds on scattered similar efforts over the last half century, but emphasizes insights from the recent flourishing in study of the history of science and of Christian interactions with science.

Even the best treatments of Wesley to date have tended to share a set of assumptions about the nature of the “science” he engaged. This is understandable, because these assumptions were championed by standard historical surveys—e.g., Herbert Butterfield, *The Origins of Modern Science* (1949)—through most of the twentieth century. These surveys contended that “science” was understood in England by the outset of the eighteenth century among leading practitioners like Isaac Newton as a mode of inquiry that was:

- 1) focused on elucidating how the processes of nature work, so that these processes could be used for human betterment;
- 2) grounded in a hypothetico-deductive methodology, wedding the certainty of mathematics with the objectivity of rigorous empirical verification of hypotheses; and
- 3) independent from religious constraints, thus at home in all cultures and times.

If this model was firmly in place by Wesley’s day, then divergence in his writings from these emphases could be read as resistance to science. Thus, among characteristics that Stephen, White, and others have identified as “anti-scientific” in Wesley are his demure from providing causal models for natural phenomena, his criticism of relying on hypotheses in developing such models, his hesitance to endorse Isaac Newton’s cosmology, his openness to providential accounts of events like earthquakes, and his ascription to the Genesis account of an idyllic creation (which conflicts with the Darwinian model of evolution).

But recent scholarship on the history of science has demonstrated that the emphases just listed for the “modern” understanding of science remained *contested* among leading practitioners through most of the eighteenth century, particularly in England.⁶ Three points that these scholars highlight are crucial for understanding and evaluating Wesley’s writings in this genre.

⁶See Andrew Cunningham & Perry Williams, “De-centering the ‘Big Picture’: *The Origins of Modern Science* and the Modern Origins of Science,” *British Journal for the History of Science* 26 (1993): 407–32; and, more generally, Peter J. Bowler & Iwan Rhys Morus, *Making Modern Science: A Historical Survey* (2005).

Transitional Character of “Science” in Eighteenth-Century England

First, this recent scholarship encourages us to take seriously that folk like Isaac Newton labeled their studies of nature not “science” but “natural philosophy” (e.g., *Philosophiae Naturalis Principia Mathematica*, 1697). This latter name reflects important continuities with earlier academic study of nature.

Medieval education stressed the difference between pursuing *understanding* of reality (*scientia*; science) and acquiring *practical knowledge* or know-how (*ars*; art). The base of university education was the seven liberal *arts*: grammar, rhetoric, dialectic, arithmetic, geometry, astronomy, and music. These sets of practical knowledge provided the foundation for students to approach the capstone study of the nature of reality itself (*scientia*)—in philosophy and theology. By the eighteenth century, philosophy was subdivided into logic, metaphysics, moral philosophy, and natural philosophy. The latter was focused on *understanding* the natural world.

What then were the assumptions of natural philosophy about its task and methods as it entered the eighteenth century?⁷ Consider the case of studying the heavens. As a *scientia*, natural philosophy focused on questions like what the heavens are made of; what moves the sun, moon, and planets; and whether the universe is finite or infinite. By contrast, astronomy—as an *art* (integrally connected to mathematics)—was devoted to tracking lights in the sky, developing formalized descriptions and predictions of their movements, offering reliable calendars, and other practical tasks. It had been rare for astronomers to ask what the heavenly bodies were made of or why they moved, while natural philosophers had devoted little attention to mathematics or the practical use of their explanations of reality.

Challenges to these disciplinary distinctions began to emerge in the late seventeenth century. On one front, Francis Bacon injected the suggestion, which gained increasing hold, that the value of *any* study of nature was proportionate to the technological benefits it provided for human betterment. On another front, Newton’s *Principia Mathematica* began to elevate the centrality of mathematics to accounts of the nature of the universe. By the beginning of the nineteenth century these and other threads had woven together the distinct agendas of *scientia* and

⁷This summary draws on several sources; one of the most recent is Peter Dear, *The Intelligibility of Nature* (2006), 1–14.

ars in the study of nature. This reality was signaled by the fading of the label “natural philosophy,” with “science” in its modern sense taking its place. But this transition stretched *through* the eighteenth century in England, resulting in numerous works with mixtures of the relevant emphases. Few works in this period embody consistently the assumptions of “modern science” outlined earlier, including Wesley’s *Survey*. The fact that Wesley discounted mathematics in this “compendium of natural philosophy,” for example, is evidence less of his resistance to “science” than of his location in this transitional period.

Preference for “Experimental” over “Speculative” Natural Philosophy

Recent scholarship has also demonstrated that the field of natural philosophy witnessed prolonged debate among competing models of physics and cosmology in eighteenth-century England, with particular focus on Newton.⁸ Everyone recognized that, with its mathematical advances (particularly calculus), Newton’s *Principia* provided more accurate description of the movements of planets, comets, and tides. But this was a task traditionally assigned to the *art* of astronomy, not the *explanatory* goal of natural philosophy, which Newton claimed in the title of his work. Thus Newton’s *Principia* was often greeted by his professional peers with puzzlement.

Some background will aid in understanding this reaction. Through most of the medieval period the reigning physics was that of Aristotle, which accounted for all natural motion by “final causes” that were integral to every type of being. Thus planets moved in their orbits because they were realizing their *entelechy* (the “innate desire to fulfill one’s nature”). As the medieval period waned, dissatisfaction with the anthropomorphic nature of this explanation grew, spawning alternative *mechanical* accounts of motion in the heavens. The starting premise of these accounts was that entelechy was limited to living beings; physical matter was inert, and was moved solely by the application of external force.

But how was this force applied? Here a divergence emerged within mechanical accounts of cosmic motion, framed by the question of whether space was a void. Accepting that space was a void made it difficult to account for application of force at a distance, such as the influence of the moon on the earth’s ocean tides. So most insisted that space was

⁸Good surveys of these debates are available in *The Cambridge History of Science; Vol. IV: The Eighteenth Century*, ed. Roy Porter (2003), 23–43; 285–304.

entirely filled by matter of varying size, including sizes not visible to empirical observation. René Descartes developed the most sophisticated mechanical account in this vein, ascribing planetary motion to the carrying force of vortices in this cosmic “stew.” If one instead accepted that space *was* a void, they typically either attributed motion to direct causation by God or echoed suggestions of earlier mystical thinkers about “resonance” across distance between certain elements.

Newton stepped into the middle of these ongoing debates. Aligning with the mechanists, he rejected entelechy, agreeing that matter was inert. Yet he eventually spurned the suggestion of forms of matter too small for empirical detection. This left space as a void. While Newton was willing to speak about God intervening occasionally to adjust the motion of planets and other cosmic bodies, he believed that the regularity and interdependence of this motion indicated instead the presence of an abiding natural law. He named this law of mutual influence of bodies upon one another “gravity.” But he immediately conceded that he could not explain how gravity conveyed its impact across the void of space. To many of his peers, Newton’s “gravity” seemed like an appeal to discredited “mystical” influences. Most others simply concluded that he had failed to do what natural philosophers were supposed to do—provide an account of *how* the movements of bodies take place.

In hindsight, Newton ventured a promising suggestion about how gravity worked in the “General Scholium” he added to the 2nd edition (1713) of *Principia*. At the end of this short piece he referred to an “electric and elastic spirit” that appears to pervade all gross bodies, noting that there was not yet sufficient experimental input to provide an account of its impact.⁹ It would take a century of further experimentation to detail electromagnetic fields, and correlate these with gravitational fields. Only at this point was Newton’s “natural philosophy” fully achieved. It is anachronistic to condemn many of his professional peers, and more general readers like Wesley, for hesitating to endorse Newton’s revision of cosmology and physics early in this process.¹⁰

But the key point to note in this episode is how Newton *agreed* with his peers. His reason for rejecting Descartes’ cosmology was its reliance on the “hypothesis” of imperceptible matter. Here Newton embodied the dominant tendency in England by the late seventeenth century to reject “speculative” natural philosophy, in favor of an

⁹English translation, *The Mathematical Principles of Natural Philosophy* (1729), 2:393.

¹⁰This general point is made well in relation to cases like Galileo in David C. Lindberg & Ronald L. Numbers, eds., *When Science and Christianity Meet* (2003).

“experimental” approach.¹¹ He specifically defended his demure from offering an *explanatory* account of gravity on the grounds that one should not turn to “hypotheses” as a substitute for experimental evidence.¹²

Theological Dimension of Eighteenth-Century Natural Philosophy

Many of the emphases of “modern science” that earlier scholars suggested were firmly in place by the outset of the eighteenth century in England have been called into question already. The suggestion which recent scholarship has most contested is the separation of “scientific” investigation from religious or theological considerations. In keeping with its medieval roots, natural philosophy at the outset of the eighteenth century retained an overarching theological perspective.¹³ Its subject-matter was nature, but it typically approached nature as the “book of God’s works.” Moreover, it assumed that part of its task was to elucidate the attributes of God that could be demonstrated from God’s works.

Newton can again serve as our example. The “General Scholium” that he added as the capstone to *Principia* was devoted mainly to insisting that “this most beautiful system of the sun, planets, and comets could only proceed from the counsel and dominion of an intelligent and powerful being,” and then elucidating the attributes of this being which we can deduce from “his most wise and excellent contrivances of things.” He concluded these reflections with an explicit affirmation that such discourse about God, drawn from consideration of nature, “does certainly belong to natural philosophy.”¹⁴

There were occasional figures like Thomas Hobbes who adopted purely materialistic accounts of nature, but these remained rare in England into the last quarter of the eighteenth century.¹⁵ Thus, Wesley was echoing the methodological assumption of most of his sources when

¹¹See Peter R. Anstey, “Experimental versus Speculative Natural Philosophy,” in P. Anstey & J. Schuster (eds.), *The Science of Nature in the Seventeenth Century* (2005), 215–42.

¹²Newton, *Mathematical Principles* (1729), 2:205 & 2:392.

¹³This point was pressed initially by Andrew Cunningham. Most have come to agree; cf. Peter Dear, “Religion, Science and Natural Philosophy: Thoughts on Cunningham’s Thesis,” *Studies in the History and Philosophy of Science* 32 (2001): 377–86; and Peter Harrison, “‘Science’ and ‘Religion’: Constructing the Boundaries,” *Journal of Religion* 86 (2006): 81–106.

¹⁴Newton, *Mathematical Principles of Natural Philosophy*, 2:388–92.

¹⁵See Jeremy Gregory, “Christianity and Culture: Religion, the Arts, and the Sciences in England, 1660–1800,” in Jeremy Black (ed.), *Culture and Society in Britain* (1997), 102–23.

he described the goal of his compendium of natural philosophy as “not barely to entertain an idle barren curiosity, but to display *the invisible things of God*, his power, wisdom, and goodness.”¹⁶ If Wesley went beyond his sources, it was in his characteristic hope that the collection would also “warm our hearts, and fill our mouths with wonder, love, and praise!”¹⁷

Characteristics of Wesley’s Engagement with the Natural “Sciences”

By this point it should be clear that it would be anachronistic to speak of Wesley bringing “science” and “religion” into dialogue. He was not engaging “science” as a discipline separated carefully from theological considerations. Nor was he interested in “religion” in general. His main goal in publishing *Survey* (and related items) was to enable his readers to benefit from “book of God’s works” as well as the “book of God’s Word,” by distilling and presenting—in accessible format—current studies of the natural world. In the judgment of some historians of science, the result was the best single survey treatment of natural philosophy in the eighteenth century for general readers.¹⁸

Focused on Descriptive Natural Philosophy

Wesley’s concern to speak to general readers surely contributed to a central characteristic of his writings in this area—the dominant focus on *describing* the natural world. He articulated this focus directly in the preface to *Survey*:

It will be easily observed that I endeavor throughout not to *account for* things, but only to *describe* them. I undertake barely to set down what appears in nature, not the cause of those appearances. The facts lie within the reach of our senses and understanding, the causes are more remote. That things are so, we know with certainty; but why they are so, we know not.¹⁹

While this restricted goal falls short of the full agenda of natural philosophy, it is not hard to catch echoes of Newton in Wesley’s

¹⁶Wesley, *Survey*, Preface, §1, *Works* (Jackson), 14:300.

¹⁷*Ibid.*, §7, *Works* (Jackson), 14:302.

¹⁸Robert Schofield, “John Wesley and Science in 18th Century England,” *Isis* 44 (1953): 337–38.

¹⁹Wesley, *Survey*, Preface, §5, *Works* (Jackson), 14:301.

delimitation. Besides, Wesley's "compendium of natural philosophy" was not intended to *advance* the discipline, but to survey the most interesting and instructive aspects of nature highlighted in recent work in the discipline.

As with his publications in biblical studies, English history, and church history, Wesley worked more as an editor than an author in the area of natural philosophy. To frame and provide the largest portion of text for the first edition of *Survey* he chose a Latin text by Johann Franz Buddeus.²⁰ The bulk of Buddeus's text was devoted to surveying the natural world—beginning with the human body; moving to other animals; then to plants, fossils, and the physical elements of earth, fire, and water; before turning toward the heavens, considering air, meteors, and cosmology. Wesley retained each of these sections in *Survey*, though he omits a subsequent section devoted to debates in physics (in keeping with his limitation to "describing," not "accounting for"). His abridgements within the various sections are infrequent, and sometimes amusing—such as deleting descriptions of human reproductive organs.

More striking are Wesley's additions to Buddeus. He incorporated into the first edition of *Survey* entire new chapters describing birds, fish, and reptiles, as well as numerous scattered additional examples of natural species and phenomena. Apparently judging that Buddeus's text did not provide *enough* description of the wonders of God's creation, Wesley scoured a number of books and journals to supplement. This gathering of additional information continued after the first edition of *Survey* was issued, being incorporated into later editions to swell the original two-volume work to five volumes. Wesley also laced his *Journal* and the *Arminian Magazine* with his own observations on natural phenomena and excerpts from his reading on the topic.

Inclined to a Modest Natural Theology

To be sure, Wesley pauses periodically in *Survey* to offer theological reflections upon the wonders of the natural world being described. These reflections lead some to describe the *Survey* as a "natural theology." While understandable, this could be misleading.

"Natural theology" was a sub-discipline in medieval education devoted to knowledge about God that could be demonstrated by rational reflection on 1) the human soul; 2) human moral insight, or "natural law"; and 3) the natural world. Thus, natural theology drew the occasional theological reflections of natural philosophy into a larger

²⁰J. F. Buddeus, *Elementa Philosophiae Theoretica* (Halle: Glauche-Hallensis, 1706).

systematic conversation about what could *theoretically* be known about God apart from special revelation.

I stress the theoretical nature of this knowledge, because natural theology was part of the Christian curriculum and its wisest medieval practitioners were aware that they were reflecting on the “book of nature” through lenses shaped to some degree by the “book of scripture.” Their concern was less to elicit faith from non-believers than to confirm and enrich nascent faith. But not all voices were so wise. Thus, there was plenty of fodder to fuel the suspicion of Protestant reformers about the triumph of unregenerate reason over revelation in the enterprise of natural theology. While they did not set the enterprise aside entirely, the Reformers’ emphasis on the sufficiency of God’s revelation in Scripture rendered theological appeal to the “book of nature” clearly subordinate and surely not essential for Christian life.

This is a point where Anglican theological reflection diverged from more staunchly Protestant approaches. The roots of this difference go back to Richard Hooker, who argued that, while scripture is sufficient for the knowledge of salvation, all Christians should be encouraged to seek the fullness of understanding and felicity, which is derived from *conjoined* study of scripture and nature. This emphasis underlies the significant interest in natural theology that emerged in England in the middle of the seventeenth century and carried through Wesley’s life into the nineteenth century.²¹ Wesley drew upon several of these works in natural theology for the theological reflections interspersed through *Survey*.

Given the use of these sources, why did Wesley designate the *Survey* a work in “natural philosophy” instead of “natural theology”? Part of the answer was the difference in amount of attention given to nature itself in each genre. Works in natural philosophy devoted the majority of their time to describing the natural world, usually gathering their explicit theological reflections in a short section at the end. By contrast, efforts in natural theology—like William Derham’s *Physico-Theology* (1713) and *Astro-Theology* (1715)—were organized around and dominated by theological reflection, interspersing brief appeals to the natural world as spring boards for or evidence backing their theological claims. On this spectrum, Wesley’s *Survey* lines up much closer to the “natural philosophy” pole.

Another reason for Wesley’s choice, I would suggest, was difference in tone. Prominent works of natural theology in his day were sliding

²¹See Richard G. Olson, *Science and Religion, 1450–1900* (2004), 84–91; and David M. Knight, *Natural Science Books in English 1600–1900* (1972), 47–62.

from the more modest classical stance of seeking to *confirm belief*, into the more ambitious Enlightenment *evidentialist apologetics*.²² The latter is a stance which assumes that the path to reliable knowledge requires first setting aside all belief, then accepting as truth only those claims for which there is undeniable evidence. On this model, the prime task of natural theology becomes demonstrating God's *existence*, not merely reflecting upon evidence of God's wisdom and character; and the standard to be attained becomes *certainty*. This model could also encourage more strident rhetoric. John Ray's *Wisdom of God Manifested in the Works of Creation* can serve as an example. Peppered through this work are comments that anyone who does not recognize that the world was produced by divine reason and art must be "stupid as the basest beasts," "stupid as the dirt one walks on," "forsaken of reason," and "sottish."²³

Wesley recognized this shift in some of his sources, and he was *not* ready to follow. But it is easy to miss this point. One must pay attention to Wesley's *selective* appropriation of his sources. For example, while he incorporated at least four extracts from Ray's *Wisdom of God* into *Survey*, Wesley chose none with the type of strident apologetic agenda just cited. While we still await a critical edition of *Survey* that highlights such editorial decisions, initial comparative study shows that Wesley typically edits his sources to remove evidentialist apologetics.²⁴ Thereby the theological reflections incorporated into *Survey* portray on balance a modest tone and agenda. They value consideration of the "book of nature" not as the *foundation* for belief in God or God's various attributes, but as a means of *strengthening* the faith, reverence, and love awakened by scripture, a means of building nascent convictions into demonstrative convictions. John Hedley Brooke, recent Professor of Science and Religion at Oxford University, has argued that Wesley's *Survey* remains of theological interest today precisely because its modest claims are less prone to the dangers in more evidentialist natural theologies.²⁵

²²See Nicholas Wolterstorff, "The Migration of the Theistic Arguments: From Natural Theology to Evidentialist Apologetics," in R. Audi & W. Wainwright (eds.), *Rationality, Religious Belief, and Moral Commitment* (1986), 38–81.

²³Ray, *The Wisdom of God Manifested in the Works of Creation* (4th edn., enlarged; 1704), 39, 47, 122–23, 249, 389.

²⁴See details in Maddox, "John Wesley's Precedent." The Center for Studies in the Wesleyan tradition, Duke University, is at work on a critical edition of the *Survey*.

²⁵John Hedley Brooke, "Science and Dissent: Some Historiographical Issues," in Paul Wood (ed.), *Science and Dissent in England, 1688–1945* (2004), 21.

Convinced of God's Care for the Whole Creation

Wesley's engagement with natural philosophy is also of continuing interest because of how it led him to revise a received theological viewpoint, moving to a stance that could do better justice to scripture! While scripture speaks of God's ultimate salvific goal as the "new heavens and earth" (i.e., transformation of everything in the universe), a variety of influences led Christians through the first millennium to assume increasingly that our final state is "heaven above." The latter was seen as a realm where human spirits, dwelling in ethereal bodies, join eternally with all other spiritual beings—a category that did not include animals!—in continuous worship of the ultimate spiritual being, God. By contrast, they assumed that the physical universe, which we abandon at death, would eventually be annihilated. Wesley imbibed this understanding of our final state in his upbringing, and through much of his ministry it was presented as obvious and unproblematic.

In the last decade of his life, however, Wesley reclaimed the biblical imagery of God's cosmic renewal, shifting his focus from "heaven above" to the future new creation.²⁶ After a tentative defense of animals having "souls" in 1775, he issued a bold affirmation of salvation for animals in the 1781 sermon "The General Deliverance." While not without precedent, this sermon was unusual for its time and is often cited as a pioneer effort in reaffirming the doctrine of animal salvation in the Western church. Broadening the scope even further, Wesley's 1785 sermon on "The New Creation" refused to limit God's redemptive purposes to sentient beings, insisting that the very elements of our current universe will be present in the new creation, though they will be dramatically improved over current conditions.

What contributed to Wesley's reclaiming of the biblical theme of the cosmic scope of redemption? A central factor was his engagement with works in natural philosophy that utilized the model of the "chain of beings." This model conceived of nature as a hierarchy of beings organized by relative excellence of abilities. Fish were higher in the chain than plants, dogs higher than fish, humans higher than dogs, and celestial beings higher than humans. A central assumption of the model was that the only type of cosmos fitting for a Perfect Being to produce was one in which every conceivable niche was occupied by its appropriate type of being. The task of natural philosophers was to place each creature

²⁶See Randy L. Maddox, "Nurturing the New Creation," in M. D. Meeks (ed.), *Wesleyan Perspectives on the New Creation* (2004), 21–52.

in its appropriate niche—a task kept lively in the eighteenth century by accounts of species in the new world from European explorers.

While it was eventually replaced, Clarence Glacken argues that the model of the chain of beings was a crucial source for the modern ecological ideas of the unity of nature and the balance and harmony of nature.²⁷ Glacken particularly highlights the role of John Ray and Charles Bonnet in adapting the model to frame surveys of the burgeoning knowledge of the natural world in the eighteenth century. Wesley was familiar with Ray's *Wisdom of God* from the early 1730s. He encountered the writings of Charles Bonnet, a prominent Swiss naturalist, in the early 1770s. It was through Bonnet that Wesley gained deeper appreciation for the implications of the chain of beings. Indeed, he came to value the model so highly that he incorporated an abridgement of Bonnet's 2-volume overview of the chain of beings into *Survey* in 1777.²⁸

One significant emphasis that Bonnet reinforced for Wesley was our human connection with the rest of the chain. He retained in his abridgment of Bonnet a response to the suggestion that it would be better if humans were angels, which counsels:

Confess your error and acknowledge that every being is endued with a perfection suited to the ends of its creation. It would cease to answer that end the very moment it ceased to be what it is. By changing its nature it would change its place and that which it occupied in the universal hierarchy ought still to be the residence of a being resembling it, otherwise harmony would be destroyed. In the assemblage of all the orders of *relative* perfections consists the *absolute* perfection of this whole, concerning which God said “that it was good.”²⁹

If this is taken seriously, there can be no eschatological ideal that limits salvation to humanity (even in the subtle form of stressing that humans are “microcosms” of the whole cosmos). It would be a thwarting of God's creative will and a deprivation of all concerned!

Wesley's pondering of this point as he read and abridged Bonnet in the mid-1770s surely played a role in his reclaiming of cosmic redemption shortly thereafter. As an Anglican, raised with deep appreciation for the *conjoined* witness of the book of scripture and the book of nature, Wesley welcomed an insight from the study of nature in his day that

²⁷Clarence J. Glacken, *Traces on the Rhodian Shore* (1967), esp. p. 379.

²⁸Charles Bonnet, *The Contemplation of Nature* (1766); cf. *Survey* (3rd edn., 1777), 4:60–333.

²⁹Wesley, *Survey* (3rd edn., 1777), 4:62.

brought back into focus a biblical (and early Christian) theme that had been obscured.

Dedicated to Placing Knowledge in Service to All

One other characteristic of Wesley's engagement with the study of nature in his day deserves attention. It concerns the *purpose* of this study. Rejecting earlier notions of natural philosophers as individual seekers after the arcane mysteries of the natural world, Francis Bacon had helped make standard by Wesley's day a self-understanding of natural philosophers as public figures in service of the public good.³⁰

Wesley's embrace of this basic emphasis is evident in *The Desideratum; or, Electricity Made Plain and Useful* (1760). Like *Survey*, this volume contains extended extracts from recent works on electricity by Benjamin Franklin, Richard Lovett and others. But Wesley makes clear in the preface that he is much less interested in the "philosophical" parts of these treatises that posit explanations of how electricity works than he is in the scattered accounts of medical benefits of electrical shock.³¹ While some viewed these accounts with scorn, Wesley collected them and added accounts from his own experiments in public clinics with "electrifying machines." He then published them inexpensively, for the public benefit of the poor in particular. (For more on Wesley's medical interests, see the next chapter).

But there was a specific current in Bacon's writings on natural philosophy which Wesley resisted—the tendency to emphasize human control and exploitation of the natural world.³² Wesley was familiar with champions of this anthropocentric, exploitive emphasis in scientific investigation. He had to look no further than William Derham, who insisted "We can, if need be, ransack the whole globe, ... penetrate into the bowels of the earth, descend to the bottom of the deep, travel to the farthest regions of this world, to acquire wealth, to increase our knowledge, or even only to please our eye or fancy."³³

This is one of the passages from Derham that was *not* selected by Wesley for inclusion in *Survey*. Nor does anything in its vein from other sources appear there. Part of the reason is that Wesley imbibed more deeply than Derham the convictions of the chain of beings model of nature. While this model highlights (as ecologists would today) a

³⁰See Stephen Gaukroger, "The *persona* of the Natural Philosopher," in C. Condren et al. (eds), *The Philosopher in Early Modern Europe* (2006), 17–34.

³¹See *Desideratum*, Preface, §§2–3, *Works* (Jackson), 14:242.

³²See Carolyn Merchant, *The Death of Nature* (1980), 164–90.

³³Derham, *Physico-Theology* (1713), 112.

range of ways that any particular species might contribute to the well-being of others above or below it in the chain, it also insists that every species has intrinsic value and a right to exist for its own purposes. John Ray, who was deeply shaped by this model, emphasized the relevant implication: “It is a generally received opinion that all this visible world was created for man, that man is the end of creation, as if there were no other end of any creature but some way or other to be serviceable to man. ... Yet wise men nowadays think otherwise.”³⁴ While Ray went on to insist that, in this interdependent chain, all species are in some sense serviceable to humanity and we would frustrate the purposes of their creation if we did not make appropriate use of them, he offered Wesley a model of *modest* anthropocentrism.

Wesley appropriated this model in a way that moved beyond Ray through his distinctive emphasis regarding our role as “stewards.” This emphasis is seen most clearly in his instructions on the use of money, where he criticizes any suggestion that resources put at our disposal are for us to use however we see fit. Wesley insists instead that everything belongs ultimately to God; that it is placed in our care to use as God directs; and that God directs us to use it for the benefit of others once our basic needs are met.³⁵ Extending this principle to the rest of creation, the focus of Wesley’s environmental ethic is better characterized as *theocentric* than anthropocentric. He portrayed the ideal relationship of humanity with creation (modeled by Adam in the Garden of Eden) as one of *modest stewardship*, where we devote our distinctive gifts to upholding God’s intentions for the balance and flourishing of all creation.³⁶

Most in Wesley’s day shared his assumption of the idyllic nature of the original creation, with peace abounding between all creatures and humans possessing the knowledge to promote the thriving of the whole. They also shared the recognition that this was very unlike the world in which we live now, with “nature red in tooth and claw” (Tennyson) and humans largely at the mercy of the forces of nature. Differences emerged around the implications drawn from the present condition for human interaction with the rest of nature. Many resigned themselves to the situation, as long as we are in the present world. Among the ones who believed that change was possible, the most significant distinction

³⁴Ray, *Wisdom of God* (4th edn., enlarged;1704), 127–28.

³⁵See Sermon 28, “Sermon on the Mount VIII,” §§11, 25–26, *Works*, 1:618–19, 628–29; Sermon 50, “The Use of Money,” *Works*, 2:266–80; and Sermon 51, “The Good Steward,” §I.1, *Works*, 2:283.

³⁶See Sermon 60, “The General Deliverance,” §I.6, *Works*, 2:444.

emerged between those (like Francis Bacon) who championed the mandate to *reclaim the mastery* over creation that was lost in the fall, and those (like Wesley) who pleaded for *resuming the loving stewardship* of creation that we inverted in the fall.³⁷ While the first two alternatives could acquiesce to (or even justify) the aggressive domination of other creatures by humans, Wesley is representative of the third alternative in his portrayal of such domination as the epitome of the fallen practices that must be set aside.³⁸ Deeply aware of how much damage we have done, the stewardship that Wesley called for us to resume is not only modest but *chastened*.³⁹

This ideal, alongside Wesley naming his compendium of natural philosophy a *Survey of the Wisdom of God in Creation*, suggests a significant revision of Bacon's rationale for the study of nature. We should seek this knowledge not to increase our ability to exploit nature but to increase our awareness of the wondrous range of creation and deepen our sensitivity to our integral connection with it all—so that we might more effectively imitate God in showing mercy to *all* of creation.

³⁷See Peter Harrison, "Subduing the Earth: Genesis 1, Early Modern Science, and the Exploitation of Nature," *Journal of Religion* 79 (1999): 86–109; esp. 102–3.

³⁸See esp. his description of the negative impact of humanity upon creation in Sermon 60, "The General Deliverance," II, *Works*, 2:442–45.

³⁹See Randy L. Maddox, "Anticipating the New Creation: Wesleyan Foundations for Holistic Mission," *Asbury Journal* 62 (2007): 49–66.